

Attachment A to the MOU in Docket 6790

ATTACHMENT A

**AVOIDED COSTS AND EXTERNALITY ADJUSTMENTS:
GENERIC INPUTS TO BE USED IN DUP
(OCTOBER 10, 2002)**

also includes certain risk adjustments

attachment consists of six single page spreadsheets

Attachment A-1: Direct Avoided Costs

Voltage # 4
Voltage Primary

	Energy and Ancillary Costs at Generation, Flat Load				Energy and Ancillary Costs at Secondary, Default Losses, Flat Load				Energy and Ancillary Costs at Secondary, Default Losses, Flat Load				Energy and Ancillary Costs at Secondary, Default Losses, Default Load Shape			
	Summer		Winter		Summer		Winter		Summer		Winter		Summer		Winter	
	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak
2003	\$47.07	\$30.24	\$41.02	\$29.29	\$55.53	\$34.33	\$49.17	\$33.65	17.97%	13.51%	\$2.99	\$33.06	\$46.76	\$32.31	\$57.36	\$35.23
2004	\$47.07	\$30.24	\$41.02	\$29.29	\$55.53	\$34.33	\$49.17	\$33.65			\$2.99	\$33.06	\$46.76	\$32.31	\$57.36	\$35.23
2005	\$47.87	\$30.76	\$41.72	\$29.79	\$56.48	\$34.92	\$50.01	\$34.22			\$3.90	\$33.62	\$47.57	\$32.86	\$58.34	\$35.83
2006	\$48.68	\$31.28	\$42.42	\$30.29	\$57.43	\$35.51	\$50.86	\$34.80			\$4.80	\$34.19	\$48.37	\$33.41	\$59.33	\$36.44
2007	\$49.49	\$31.80	\$43.12	\$30.79	\$58.38	\$36.09	\$51.70	\$35.38			\$5.71	\$34.76	\$49.17	\$33.96	\$60.31	\$37.04
2008	\$50.29	\$32.31	\$43.83	\$31.29	\$59.33	\$36.68	\$52.54	\$35.95			\$6.62	\$35.32	\$49.97	\$34.52	\$61.29	\$37.64
2009	\$51.10	\$32.83	\$44.53	\$31.80	\$60.28	\$37.27	\$53.38	\$36.53			\$7.53	\$35.89	\$50.77	\$35.07	\$62.27	\$38.25
2010	\$53.02	\$34.07	\$46.20	\$32.99	\$62.55	\$38.67	\$55.39	\$37.90			\$8.49	\$37.24	\$52.68	\$36.39	\$64.62	\$39.68
2011	\$54.90	\$35.28	\$47.85	\$34.16	\$64.77	\$40.04	\$57.36	\$39.25			\$9.41	\$38.56	\$54.55	\$37.68	\$66.91	\$41.09
2012	\$56.86	\$36.53	\$49.55	\$35.38	\$67.07	\$41.47	\$59.40	\$40.64			\$10.33	\$39.93	\$56.49	\$39.02	\$69.29	\$42.55
2013	\$58.88	\$37.83	\$51.31	\$36.64	\$69.46	\$42.94	\$61.51	\$42.09			\$11.25	\$41.35	\$58.50	\$40.41	\$71.75	\$44.07
2014	\$60.98	\$39.18	\$53.14	\$37.94	\$71.93	\$44.47	\$63.70	\$43.59			\$12.17	\$42.83	\$60.58	\$41.85	\$74.31	\$45.64
2015	\$63.24	\$40.63	\$55.11	\$39.35	\$74.60	\$46.12	\$66.06	\$45.20			\$13.10	\$44.41	\$62.83	\$43.40	\$77.06	\$47.33
2016	\$65.69	\$42.21	\$57.25	\$40.88	\$77.50	\$47.91	\$68.63	\$46.96			\$14.03	\$46.14	\$65.27	\$45.09	\$80.06	\$49.17
2017	\$68.14	\$43.78	\$59.37	\$42.40	\$80.38	\$49.69	\$71.18	\$48.71			\$14.96	\$47.85	\$67.70	\$46.76	\$83.04	\$51.00
2018	\$70.67	\$45.41	\$61.58	\$43.98	\$83.37	\$51.54	\$73.83	\$50.52			\$15.89	\$49.63	\$70.21	\$48.50	\$86.13	\$52.90
2019	\$73.31	\$47.10	\$63.88	\$45.62	\$86.48	\$53.47	\$76.58	\$52.40			\$16.82	\$51.49	\$72.84	\$50.32	\$89.34	\$54.87
2020	\$76.05	\$48.87	\$66.28	\$47.33	\$89.72	\$55.47	\$79.45	\$54.37			\$17.75	\$53.42	\$75.56	\$52.20	\$92.69	\$56.92

Escalation after 2020: 3.7%

NOTES

Summer Includes April through November.
Winter Includes Dec through March.

Cumulative Losses by Period and Voltage

Veeco	3.5%	2.5%	3.9%	2.8%
sub-trans	4.9%	3.5%	5.5%	3.9%
Dist s/s	5.7%	4.1%	6.4%	4.6%
Primary	12.6%	9.3%	14.0%	10.3%
Secondary	18.0%	13.5%	19.9%	14.9%

Incremental Losses by Period and Voltage

Veeco	3.5%	2.5%	3.9%	2.8%
sub-trans	1.4%	1.0%	1.6%	1.1%
Dist s/s	0.9%	0.6%	1.0%	0.7%
Primary	7.3%	5.4%	8.2%	6.0%
Secondary	6.2%	4.6%	6.8%	5.1%

Attachment A-1: Direct Avoided Capacity
Part 2: Installed Capacity with Reserves(\$/kW-yr.)

Voltage # 4
Voltage Primary

Retail for EVT Periods

	Secondary Losses			Other Losses			
	Winter	Summer	Spring and Fall	Winter	Summer	Spring and Fall	
	Period Ratios	0.39	0.60	0.30	0.39	0.60	0.30
	Losses	14.2%	14.2%	14.2%	9.8%	9.8%	9.8%
Wholesale:							
2003	\$9.60	\$4.28	\$6.58	\$3.29	\$4.11	\$6.32	\$3.16
2004	\$9.60	\$4.28	\$6.58	\$3.29	\$4.11	\$6.32	\$3.16
2005	\$13.65	\$6.08	\$9.35	\$4.68	\$5.84	\$8.99	\$4.50
2006	\$19.40	\$8.64	\$13.30	\$6.65	\$8.31	\$12.78	\$6.39
2007	\$27.59	\$12.29	\$18.90	\$9.45	\$11.81	\$18.17	\$9.09
2008	\$39.22	\$17.47	\$26.87	\$13.44	\$16.79	\$25.84	\$12.92
2009	\$55.75	\$24.83	\$38.20	\$19.10	\$23.88	\$36.73	\$18.37
2010	\$57.20	\$25.48	\$39.20	\$19.60	\$24.50	\$37.69	\$18.84
2011	\$58.69	\$26.14	\$40.21	\$20.11	\$25.13	\$38.67	\$19.33
2012	\$60.22	\$26.82	\$41.26	\$20.63	\$25.79	\$39.67	\$19.84
2013	\$61.78	\$27.52	\$42.33	\$21.17	\$26.46	\$40.70	\$20.35
2014	\$63.39	\$28.23	\$43.43	\$21.72	\$27.15	\$41.76	\$20.88
2015	\$65.04	\$28.97	\$44.56	\$22.28	\$27.85	\$42.85	\$21.42
2016	\$66.73	\$29.72	\$45.72	\$22.86	\$28.58	\$43.96	\$21.98
2017	\$68.46	\$30.49	\$46.91	\$23.46	\$29.32	\$45.10	\$22.55
2018	\$70.24	\$31.28	\$48.13	\$24.07	\$30.08	\$46.28	\$23.14
2019	\$72.07	\$32.10	\$49.38	\$24.69	\$30.86	\$47.48	\$23.74
2020	\$73.94	\$32.93	\$50.67	\$25.33	\$31.66	\$48.72	\$24.36

Escalation after 2020: 2.6%

Cumulative Losses by Voltage

Velco	2.7%
sub-trans	3.7%
Dist s/s	4.3%
Primary	9.8%
Secondary	14.2%

Incremental Losses by Voltage

Velco	2.7%
sub-trans	1.1%
Dist s/s	0.7%
Primary	5.7%
Secondary	4.9%

Attachment A-2: Avoided Costs of Non-Targeted T&D

Full Values

	Total	Velco		Company		Distribution		
		Transmission		Subtransmission		Subs		
		Subs	Lines	Subs	Lines	Primary	Secondary	
Percentage	100%	6%	3%	13%	18%	29%	26%	5%
Year-2002 \$/KW-yr.	\$96.4/KW-yr.	\$5.8	\$2.9	\$12.5	\$17.4	\$28.0	\$25.1	\$4.8
With losses to secondary	\$110.1/KW-yr.	\$6.6	\$3.3	\$14.3	\$19.8	\$31.9	\$28.6	\$5.5
With losses to primary	\$108.9/KW-yr.	\$6.5	\$3.3	\$14.2	\$19.6	\$31.6	\$28.3	

Rules for Inclusion of Non-targeted T&D

Secondary

Full value immediately

Other voltages not specifically reviewed

Full value immediately

Other voltages for which no equipment is targeted

Methodology to be developed in extended collaborative

Voltages for which some equipment is targeted

Methodology to be developed in extended collaborative

Attachment A-3

Part 1: Derivation of Settlement Externalities (1997 Dollars)

Externalities per pound and per MWh were calculated based on *Power to Save*, then scaled back linearly to total the \$7-per-MWh value stipulated by the parties in the DN 5980 Settlement.

	Large Gas Combined Cycle						
	<i>Power to Save</i> ^a			Scaled 1997\$ ^b		Scaled 2002\$/lb. ^b	
	\$/lb.	lb./MWh	\$/MWh	\$/lb	\$/MWh	\$/lb	\$/MWh
NOx	4.07	0.06	0.24	2.56	0.15	2.87	0.17
SO ₂	0.96	0.004	0.00	0.60	0.00	0.68	0.00
PM-10	4.98	0.04	0.22	3.13	0.14	3.51	0.15
CO ₂	0.014	776	10.48	0.0085	6.58	0.0095	7.39
CO	0.54	0.1	0.05	0.34	0.03	0.38	0.03
UHC	3.34	0.05	0.15	2.10	0.10	2.36	0.11
TOTAL			\$11.1/MWh		\$7.0/MWh		\$7.9/MWh

NOTES

^a Based on dollars-per-ton values from *Power to Save*, Appendix 4-4, Attachment 1:

Externalities Per Ton of Pollutant

	1992\$	1997\$
NOx	7,200	8,143
SO ₂	1,700	1,923
PM-10	8,800	9,953
CO ₂	24	27
CO	960	1,086
UHC	5,900	6,674

1997-dollar values for CO and UHC are calculated from 1992-dollar values.

^b Scaled linearly to total the \$7-per-MWh value stipulated by the parties in the DN 5980 Settlement.

Attachment A-3

Part 2: Externality Examples (2002 Dollars)

Characteristics	Large Gas Combined Cycle		Uncontrolled Diesel Engine		Micro Turbine		3-way Catalyst Gas-Fired Rich Burn IC Engine		Small Gas Turbine		Phosphoric Acid Fuel Cell		
	Efficiency % (HHV)	Btu/kWh	51%	38%	25%	29%	27%	29%	27%	37%	27%	37%	
Typical Capacity (kW)	6,640	8,982	13,652	11,769	13,652	11,769	12,780	11,769	12,780	9,224	12,780	9,224	
Fuel	500,000 Natural Gas	1,000 Diesel	25 Natural Gas	1,000 Diesel	25 Natural Gas	1,000 Natural Gas	4,600 Natural Gas	1,000 Natural Gas	4,600 Natural Gas	200 Natural Gas	4,600 Natural Gas	200 Natural Gas	
Externalities	2002\$	lb/MWh	\$/MWh	lb/MWh	\$/MWh	lb/MWh	\$/MWh	lb/MWh	\$/MWh	lb/MWh	\$/MWh	lb/MWh	\$/MWh
NOx	\$2.8737	0.06	0.17	21.8	62.52	0.44	1.27	0.5	1.34	1.15	3.30	0.03	0.10
SO ₂	\$0.6786	0.004	0.00	0.454	0.31	0.008	0.01	0.007	0.00	0.008	0.01	0.006	0.00
PM-10	\$3.5125	0.04	0.15	0.78	2.73	0.09	0.32	0.03	0.11	0.08	0.30	-	-
CO ₂	\$0.0095	776	7.39	1,432	13.64	1,596	15.20	1,376	13.11	1,494	14.23	1,078	10.27
CO	\$0.3832	0.1	0.03	6.2	2.38	1.2	0.46	4.0	1.54	0.7	0.27	-	-
UHC	\$2.3553	0.05	0.11	1.2	2.93	0.42	1.00	0.4	0.95	1.10	2.59	-	-
TOTAL \$/MWh		\$7.86		\$84.51		\$18.25		\$17.05		\$20.70		\$10.37	
Cogeneration Environmental Credit (assumes same fuel in avoided boiler)													
Total Cogen. Effic. 80%													
Avoided Boiler Effic. 85%													
Fraction of Input Energy Saved by Cogeneration				49%		65%		60%		63%		51%	
SO ₂ Emission Credit (lb/MWh)				0.224	\$6.89	0.005	\$9.84	0.004	\$7.87	0.005	\$8.93	0.003	\$5.20
CO ₂ Emission Credit (lb/MWh)				707		1,032		825		937		545	
Net Environmental Cost with Cogeneration ^b				\$77.62		\$8.41		\$9.18		\$11.77		\$5.17	

NOTES

^a For system supply, externalities should be computed for the change in load times line losses from load to generation.

^b Cogeneration credits should be added for other pollutants, based on the emissions of the avoided boiler.

Attachment A-3

Part 3: Risk Adjustments

Equivalent Risk Adjustments

Docket No. 5270 presents the risk adjustment as a 10% reduction in DSM cost, which is equivalent to an 11.1% increase in avoided costs. Use of either risk column will provide the same comparisons between resources, so long as one column is used consistently in the analysis.

	<u>Risk Adjustment As</u>	
	<i>Cost Adder</i>	<i>Docket 5270 Cost Discount</i>
Energy Efficiency (includes fuel switching)	0%	-10.0%
System Power	11.1%	0.0% ^a
T&D	11.1%	0.0% ^a
Load Management	To be Determined in ASCs	
Distributed Generation	To be Determined in ASCs	

NOTES

All resources are discounted for participation, persistence, coincidence, free riders and other expected reductions. Costs are net of customer benefits: avoided fuel cost for CHP, avoided backup generators for DG

^a *These are default values; the ASCs may adjust them so long as the average is consistent with the default*